EPSON

EPSON RC+ 7.0 Option

Part Feeding

Hopper & Hopper Controller

Rev.2 EM192S3930F

EPSON RC+ 7.0 Option Part Feeding Hopper & Hopper Controller Rev.2

EPSON RC+ 7.0 Option

Part Feeding Hopper & Hopper Controller

Rev.2

FOREWORD

Thank you for purchasing our robot system.
This manual contains the information necessary for the correct use of the EPSON RC+ PartFeeding option.
Please carefully read this manual and other related manuals before installing the robot system.
Keep this manual handy for easy access at all times.

WARRANTY

The robot system and its optional parts are shipped to our customers only after being subjected to the strictest quality controls, tests, and inspections to certify its compliance with our high performance standards.

Product malfunctions resulting from normal handling or operation will be repaired free of charge during the normal warranty period. (Please contact the supplier of your region for warranty period information.)

However, customers will be charged for repairs in the following cases (even if they occur during the warranty period):

1. Damage or malfunction caused by improper use which is not described in the manual, or careless use.
2. Malfunctions caused by customers' unauthorized disassembly.
3. Damage due to improper adjustments or unauthorized repair attempts.
4. Damage caused by natural disasters such as earthquake, flood, etc.

Warnings, Dangers, Usage:

1. If the robot system associated equipment is used outside of the usage conditions and product specifications described in the manuals, this warranty is void.
2. If you do not follow the WARNINGS and DANGERS in this manual, we cannot be responsible for any malfunction or accident, even if the result is injury or death.
3. We cannot foresee all possible dangers and consequences. Therefore, this manual cannot warn the user of all possible hazards.

TRADEMARKS

Microsoft, Windows, Windows logo, Visual Basic, and Visual C++ are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries. Other brand and product names are trademarks or registered trademarks of the respective holders.

TRADEMARK NOTATION IN THIS MANUAL

Microsoft® Windows® 7 Operating system
Microsoft® Windows® 8 Operating system
Microsoft® Windows® 10 Operating system
Throughout this manual, Windows 7, Windows 8, and Windows 10 refer to above respective operating systems. In some cases, Windows refers generically to Windows 7, Windows 8, and Windows 10.

NOTICE

No part of this manual may be copied or reproduced without authorization.
The contents of this manual are subject to change without notice.
Please notify us if you should find any errors in this manual or if you have any comments regarding its contents.

MANUFACTURER

SEIKO EPSON CORPORATION

CONTACT INFORMATION

Contact information is described in “SUPPLIERS” in the first pages of the following manual:

Robot System Safety and Installation Read this manual first

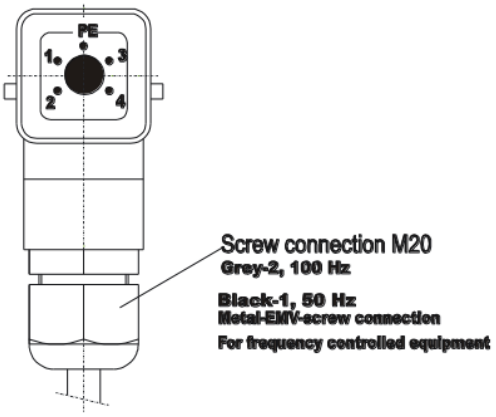
Hardware (Hopper)

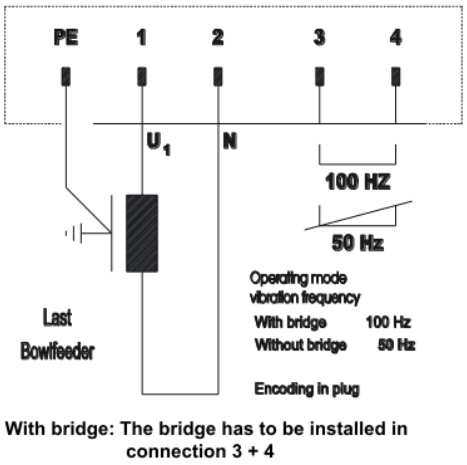
Hardware (Hopper Controller)

Hardware
(Hopper)

1. Technical data

Pin assignment





With bridge: The bridge has to be installed in connection 3 + 4

Linear feeder type	SLL 400-400
Dimensions L x B 2) x H (mm)	430 x 84 x 103
Weight	6,5
Insulation type	IP54
Connecting cable length (m)	1,5
Power consumption 1) (VA)	120
Current consumption 1) (A)	0,6
Magnet nominal voltage 1) / Frequency (V / Hz)	200 / 50
Number of magnets	1
Magnet type	WZAW 040
Magnet color	black
Air gap (mm)	1,0
Vibration frequency Hz	100 Hz
Number of spring assemblies	2
Standard no. of springs Number per spring assembly	2 x 2,0 3 x 3,0
Spring dimensions (mm) Length (gauge for boreholes) x width	70(56) x 40(18)
Spring size (mm)	2,0 und 3,0
Quality of the spring fastening screws	8.8
Tightening moment of the spring fastening screws	15 Nm
Max. weight of the oscillating units (linear track) dependent on the mass moment of inertia and required running speed	ca. 5 kg
Max. track length (mm)	700
Max. useful weight of the linear feeder dependent on the mass moment of inertia and required running speed	1,5 – 2 kg

[1)] At special connecting values (voltage/frequency see type plate at the magnet

[2)] Width dimension for design b (= wide)

2. Safety instructions

The conception and production of our linear feeders has been carried out very carefully, in order to guarantee trouble-free and safe operation. You too can make an important contribution to job safety. Therefore, please read these short operating instructions completely before starting the machine. Always observe the safety instructions!

Make sure that all persons working with or at this machine carefully read and observe the following safety instructions!

NOTE ☞	This hand points to information that gives you useful tips for the operation of the linear feeder.

⚠ WARNING!	This warning triangle marks the safety instructions. Non-observance of these warnings can result in serious or fatal injuries!

Dangers occurring at the machine

- The most dangerous parts of the machine are the electrical installations of the linear feeder. In case the linear feeder gets wet, there is the danger of an electric shock!
- Make sure that the protection ground of the electric power supply is in perfect condition!

Intended use

The intended use of the linear feeder is the actuation of conveying tracks. These are used for linear transport and feeding of correctly positioned mass-produced parts, as well as for the proportioned feeding of bulk material. The intended use also includes the observance of the operating and servicing instructions.

Please take the technical data of your linear feeder from the table described in *1. Technical data*. Make sure that the connected load of the linear feeder, control unit and power supply is compatible.

NOTE ☞	The linear feeder may only be operated in perfect condition!

The linear feeder may not be operated in the explosive or wet area.

The linear feeder may only be operated in the configuration drive unit, control unit and oscillating unit, as specified by the manufacturer.

No additional loads may act upon the linear feeder, apart from the material to be transported, for which the special type is designed.

⚠ WARNING!	It is strictly prohibited to put any safety devices out of operation!

Demands on the user

- For all activities (operation, maintenance, repair, etc.) the details of the operating instructions must be observed.
- The operator must avoid any working method which would impair the safety of the linear feeder.
- The operator must take care that only authorized personnel works at the linear feeder.
- The user is obliged to inform the operator immediately about any changed conditions at the linear feeder that could endanger safety.

 WARNING!	The linear feeder may only be installed, put into operation and serviced by expert personnel. The binding regulation for the qualification of electricians and personnel instructed in electrical engineering is valid, as defined in IEC 364 and DIN VDE 0105 part 1.

 DANGER!	Since the electromagnet-field may have an impact on persons with pacemakers it is recommended to keep a minimum distance of 25 cm.

 DANGER!	- Unplug the main power plug when plugging / unplugging the cord. - Unplug the main power plug when performing adjustment and maintenance.

Noise emission

The noise level at the place of operation depends on the complete equipment and the material to be transported. The determination of the noise level according to the EC-Regulations “Machinery” can therefore only be carried out at the place of operation.

If the noise level at the place of operation exceeds the limit permitted, noise prediction hoods may be used, which we offer as accessory parts (see catalogue).

Standards and regulations

The device was built according to the following standards and regulations:

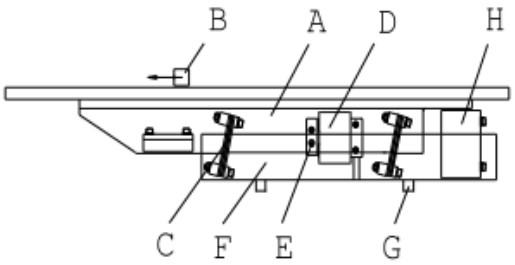
- Low voltage directive 2014/35/EU
- EMC directive 2014/30/EU

We assume that our product is to be integrated in a fixed machine. The provisions of the EMC directive 2014/30/EU has to be considered by the user.

- Applied harmonized Standards
  EN 60204, T.1

3. Construction and function of the linear feeder

Linear feeders are used for the actuation of conveying equipment. The actuation takes place by an electromagnet. The following schematic diagram shows the function of a linear feeder:



A Conveying track and oscillating weight
B Material to be conveyed
C Spring assembly
D Drive magnet
E Armature
F Counterweight
G Shock absorber
H Countermass

The linear feeder is a device of the family of vibratory bowl feeders. It is, however, equipped with a linear conveyor. Electromagnetic vibrations are converted into mechanical vibrations and are used for conveying material B. If magnet D, which is securely connected with the counter mass F, is supplied with current, it generates a power that, dependent on the vibration frequency of the mains supply, attracts and releases armature E. Within a period of the 50 Hz of the A.C. network the magnet achieves its maximum power of attraction twice, as this is independent of the direction of the current conduction. The vibration frequency therefore is 100 Hz. In case a half-wave is locked, it is 50 Hz. Please take the vibration frequency of your linear feeder of the table described in *1. Technical data*.

A linear feeder is a resonant system (spring-mass-system). The result is that the adjustment made at the factory will rarely meet your requirements. Chapter 5 describes in detail how your linear feeder is adapted to your requirements.

Controlling of the linear feeder takes place by a low loss electronic control unit type ESG 1000. At its front panel it is provided with a 7-pole plug-in connection, by which it is connected to the linear feeder.

The pin assignment of the socket is shown in the table described in *1. Technical data.*

NOTE ☞	For more information on the complete range of control units, please refer to *Hardware (Hopper Controller)*.

All control units have got two main operating elements:

- By the mains switch the linear feeder is switched on or off.
- By the turning knob the conveying capacity of the transport unit is set.

4. Transport and mounting

Transport

NOTE 	Take care that the linear feeder cannot dash against other things during transport.

The weight of the linear feeder is taken from the table described in *1. Technical data*.

Mounting

The linear feeder should be mounted on a stable substructure (available as an accessory part) at the place where it is used. The substructure must be dimensioned in a way that no vibrations of the linear feeder can be carried away.

Linear feeders are fastened to the shock absorbers from below (part G in the general drawing in *3. Construction and function of the linear feeder*).

The following table will give you a summary of the bore data of the various types:

Linear feeder type	Length in mm	Width in mm	Shock absorber thread
SLL 400 – 400	200	100	M6

Make sure that the linear feeder cannot come into contact with other devices during operation.

For further details on the control unit (bore plan, etc.), refer to *Hardware (Hopper Controller)*.

 WARNING!	Be careful not to get hand, fingers, or feet caught and/or have equipment damaged by a fall of the hopper or the hopper-controller. When working, please wear Protective equipment such as safety shoes.

5. Starting

NOTE ☞	Ensure that the frame (stand, base, frame etc.) is connected with the ground wire (PE). If necessary, prediction earthing on spot should be provided.

Check, whether

- the linear feeder stands in an isolated position and does not come in securely with a solid body
- the linear track is screwed down and adjusted
- the connecting cable of the linear feeder is plugged in at the control unit.

⚠ WARNING!	The electric connection of the linear feeder may only be made by trained personnel (electricians)! In case modifications are made at the electric connection, it is absolutely necessary to observe the operating instructions “control units”.

- The available supply voltage (frequency, voltage, output) is in accordance with the connection data of the control unit (see type plate at the control unit).

Plug in the mains cable of the control unit and switch on the control unit by the mains switch.

The optimal operative range of the linear feeder is at a controller position of 80% at the control unit. In case of higher deviations (>=±15%) a readjustment should be carried out.

5.1 Adjustment

With spring assemblies for a conveying track weight, which is approx. 25 % lower than the maximum track weight described in *1. Technical data*, and a running speed of 4 - 6 m/min. In case heavier or lighter conveying tracks are installed or considerably faster or slower conveying speeds are required, the spring assemblies must be modified. For that the following basic rules have to be observed:

NOTE ☞	At first a rough adjustment of the conveying speed (adjustment of the natural frequency) must be made, which is followed by the adjustment of the running behavior. Finally you adjust the conveying speed (natural frequency).

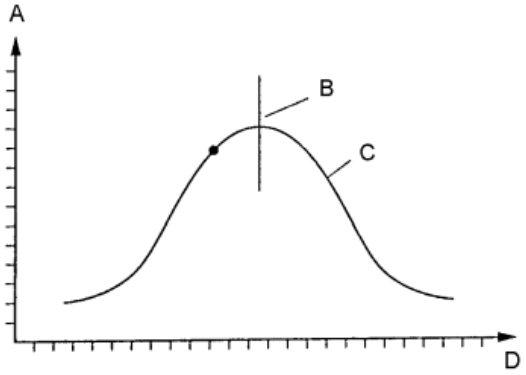
5.1.1 Adjusting the required running speed

In case the required running speed is not achieved with the standard spring assembly, the current adjustment range of the oscillating system must at first be found out, either natural frequency below 50 or 100 Hz or natural frequency above 50 or 100 Hz.

For that one or two plates are dismounted from the movable counterweight for a trial. If a change in the running speed on the conveying track is recognized, it can be taken from the table below, whether springs must be installed or removed. The controller position at the control unit may not be changed during this trial. In the factory the different sizes are equipped.

Change of the running speed on the conveying track after dismounting the counterweight	Required running speed is to be increased	Required running speed is to be reduced	Position of the natural frequency
Slower	1.Install counter weight 2. Dismount springs	1.Install counter weight 2. Install springs	> 50 or 100 Hz
Faster	1.Install counter weight 2. Install springs	1.Install counter weight 2. Dismount springs	< 50 or 100 Hz

The following graphic chart shows the resonance curve of a linear feeder:



A Conveying speed
B Natural frequency
C Resonance curve (not true to scale)
D Spring power (number of springs)

NOTE ☞	The resonance curve of the linear feeder may not correspond to the mains frequency.

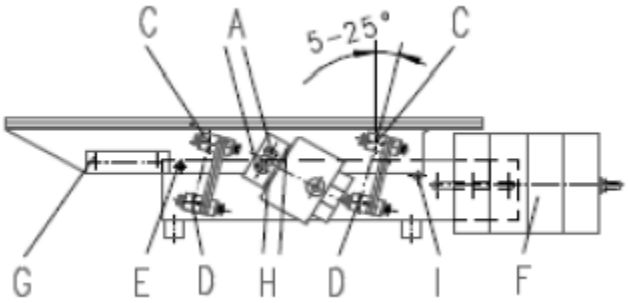
When exchanging the springs the valency of the various leaf spring sizes must be considered. As the spring size enters into the spring power in square, the following examples must be observed:

- 2.5 mm spring size = 6.25 spring power
- 3.0 mm spring size = 9.0 spring power
- 3.5 mm spring size = 12.25 spring power

A 3.5 mm leaf spring has about the same valency as two 2.5 mm leaf springs. For that reason it is recommendable to carry out the final or fine adjustment always with thin leaf springs.

NOTE 	When changing the masses of counter and oscillating weights (installation or dismounting of counter or additional weights) the running speed or the natural frequency of the linear feeder is changed. If necessary leaf springs must be added or removed.

Changing the spring assembly for linear feeders type SLL 400



Unscrew the 4 or 6 upper lateral spring fastening screws (“C”) (M6 DIN 912). The complete oscillator with mounted track can now be lifted upwards. Remove the desired spring pack by releasing the lower lateral spring fastening screws (“D”) (M6 DIN 912).

Before removing the spring pack, the protective conductor on the feeding side has to be taken out from the lower spring fixture.

Screw the removed spring pack into the mounting device for fitting springs size 400 and fasten it in a vise. When installing and removing the laminated springs, make sure there are little distance plates between the springs.

If you do not have a mounting device for spring packs, proceed as follows:

Fix the dismounted spring pack horizontally in a parallel vise with smooth clamping jaws and perform the desired adjustments. When tightening the spring packs, make sure they are in parallel alignment.

The mounting device aligns the two spring fixtures to one another. The fastening screws of the springs are to be tightened with a torque of 12.5 Nm.

Reinstall the complete spring pack

To restore the former alignment of the linear feeder, the adjusting bore on the upper counter mass end (“E”) has to be aligned to the oscillator with a pin (6 mm in diameter with a minimum length of 70 mm).

On the feeding side, the oscillator is aligned near the counterweight by inserting another pin (6 mm in diameter with a minimum length of 70 mm) into the adjusting bore (“I”).

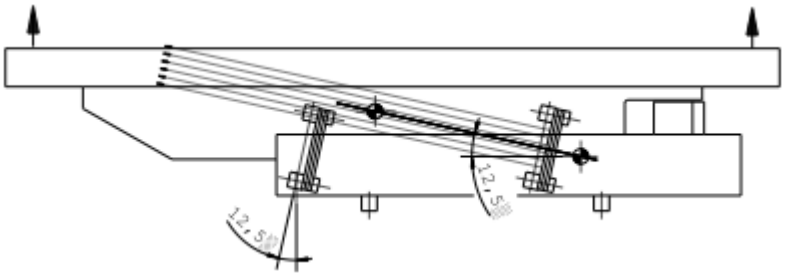
After having adjusted the spring angle to the desired position, the lateral fixing screws are tightened again with a torque of 12.5 Nm.

Before putting into operation again, please remember to remove the centering pins.

5.1.2 Adjusting the required running behavior or the synchronism of the linear feeder track

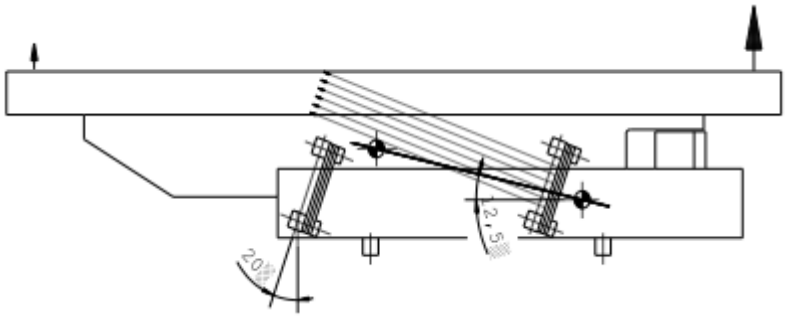
In order to achieve synchronism of the linear feeder track, the spring angle must be adjusted the same as the gravity center angle. The gravity center angle is determined by the position of the two gravity centers of oscillating and counterweight.

Example with a gravity center angle of 12.5 °



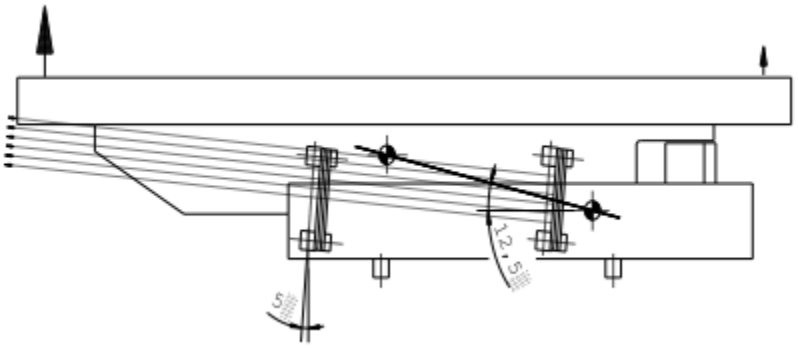
Spring angle equals gravity center angle

The force direction of the springs is initiated exactly on the gravity center of the vibrator. Consequence: The height amplitude is the same at the feeding and at the discharge side.



Spring angle larger than the gravity center angle

The force direction of the springs is initiated before the gravity center of the vibrator. Consequence: The height amplitude is higher in the feeding area than in the discharge area.



Spring angle is smaller than the gravity center angle

The force direction of the springs is initiated behind the gravity center of the vibrator. Consequence: The height amplitude is smaller in the feeding area than in the discharge area.

In case the angles are not the same, the conveying tracks are running unsteadily. In case of very high deviations of this angle the conveying track can even show lateral deflections (oscillations).

The gravity centers or angles can be influenced by the following measures:

- Add or displace counterweight ("F")
- Choose the track position and height in a way that a favorable gravity center is achieved
- Keep the track weight as low as possible, in order to keep the vibrator gravity center as low as possible.
- Install an additional counterweight in the vibrator discharge area ("G").
- Adjust the spring angle to the gravity center angle

The spring angle of the linear feeders type SLL 400 can be adjusted between 5° and 25°. If the gravity center angle is outside this area, synchronism of this track is impossible. In this case modifications must be made at the counter and oscillating weight gravity centers according to the points listed above.

Spring angle adjustment

Fix the vibrator towards the counter mass (refer to *5.1 Adjustment*). After that the four lateral spring fastenings ("C" + "D") can be loosened, in order to swing the spring assembly into the desired spring angle. After that fasten the spring fastening screws with the permissible tightening torque (refer to *1. Technical data*) and remove the adjusting screws, distance plates or bolts.

Adjustment of the magnet air gap

The air gap between armature and magnet adjusted in the factory can be taken from *1. Technical data.*

The adjustment of the air gap can be made from the outside without dismounting any component parts. Slightly loosen both armature fastening screws ("A" or "A" + "B") (M5 DIN 912 at linear feeder type SLL 400:). In both bore holes in the oscillating profile ("H") a round pin (Φ 1mm, 80 mm long at SLL400;) must be stuck through. By pressing both armature fastening screws against running direction and subsequent tightening the specified magnetic gap is adjusted (refer to *1. Technical data*). After that pull out the round pins. In case there are no round pins, the magnetic gap can be adjusted from below (perhaps after dismounting the complete linear feeder from the supporting structure or from the supporting table) by means of a feeler gauge or distance pieces according to the prescribed magnetic gap.

NOTE ☞	At a turning knob position of 100% at the control unit and a correctly adjusted magnetic gap the magnet may not dash against the armature. In case this happens, proceed according to point *5.1 Adjustment* (remove springs).

The aim of the adjustment is:

If the required conveying speed is achieved at a controller position of 80 %, the conveying speed must always increase when a weight plate is removed.

NOTE ☞	Take care that the number of springs per spring assembly does not differ by more than 2-3 springs.

6. Specifications for the design of the track

As the vibrator is sufficiently flexible owing to the use of aluminum profile, the conveying tracks should be of a very light design. Only in case of conveying tracks projecting over the vibrator (in the feeding area max. 100 mm, in the discharge area max. 200 mm) the design of the conveying track must be correspondingly inflexible to distortion. In order to achieve an additional, lateral distortion-inflexibility, a one-piece supporting plate of 4 - 6 mm thick aluminum should be screwed on the linear feeder profiles. By replacing the linear feeder profiles you get the small “S” or broad “B” construction type.

The higher the feeding speed is, the larger must the clearance between upper edge of the part to be conveyed and the lower edge of the cover of the conveying track be chosen. If possible the clearance must be brought to the largest permissible measure. When installing and fastening the conveying tracks the following points must be observed:

- Install closely to the upper edge of the vibrator
- If possible put it on the center of the aluminum profile
- Choose solid, rigid screws (minimum M5)
- In order to achieve a higher conveying speed the linear feeder can be installed with a slight inclination of approx. 3-5°.
- Under no circumstances use loose or hinged, unscrewed covers.

The conveying track may also consist of several short sections, which are assembled and screwed down on the vibrator. At the feeding side flat chamfers facilitate passing of the workpiece from one to the other conveying track section.

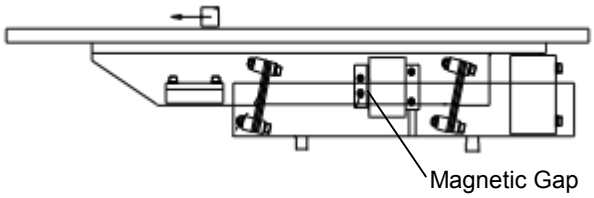
The construction consisting of several sections is especially recommended for the use of hardened or surface hardened conveying tracks (low distortion manufacture).

Very light conveying tracks can be realized by using aluminum-rails or aluminum profiles. The necessary abrasion resistance can be achieved by segments made of hardened spring band steel, which are screwed in or on. These segments are available on request at the manufacturer.

7. Maintenance

The linear feeders are generally maintenance-free. They should, however, be thoroughly cleaned in case they are considerably dirty or after fluids have been spilled over them.

- For that first unplug the mains plug.
- Clean the inside of the linear feeder, especially the magnetic gap.



- After the mains plug has been plugged in, the linear feeder is ready for operation again.

8. Spare parts (Maintenance parts)

Please contact to the supplier of your region.

9. What to do, if... (Instructions for trouble-shooting)

⚠ WARNING!	The control unit or the connecting terminal box may only be opened by an electrician. Before opening the a.m. devices, the mains plug must be unplugged!

In case the conveying track has no steady running speed or height amplitude, but at the discharge side a higher running speed or height amplitude than on the feeding side, the spring angle has been wrongly adjusted to the gravity center angle (refer to *5.1.2 Adjusting the required running behavior or the synchronism of the linear feeder track*). In this case proceed as follows:

- Adjust the spring angle larger at all spring assemblies
- Displace the counterweight “F” against running direction
- Install additional weight plates at the counterweight
- Install additional weight “G” into the oscillating profile

In case the conveying track has no steady running speed or height amplitude, but at the feeding side a higher running speed or height amplitude than at the discharge side, the spring angle is wrongly adjusted to the gravity center angle (refer to *5.1.2 Adjusting the required running behavior or the synchronism of the linear feeder track*). In this case proceed as follows:

- Adjust the spring angle smaller at all spring assemblies
- Displace the counterweight “F” in running direction

- Dismount additional weight plates at the counterweight
- Dismount additional weight “G” from the oscillating profile

If the running behavior is unsteady at a steady conveying track speed and if the material to be transported jumps too much between bearing surface and cover, the gravity center angle and the adjusted spring angle of the total system is too large and consequently the height amplitude too high. In this case proceed as follows:

- Change the gravity center angle (make it more “flat”), by displacing the counterweight “F” against the running direction, installing additional weight plates at the counter weight, installing an additional weight in the oscillating profile and choosing a lighter design for the conveying track if necessary.
- Adjust the spring angle according to the gravity center angle.

If the running behavior is unsteady especially at material to be conveyed with large surface or which is fouled by oil, the gravity center angle and the adjusted spring angle of the total system is too small. The height amplitude is too low.

Owing to that the motion of projection cannot take place and in case of oily workpieces the adhesive power is higher than the projectile power, i. e. the workpiece cannot be lifted.

In this case proceed as follows:

- Change the center of gravity angle (make it “steeper”), by displacing the counterweight “F” in running direction, dismounting additional weight plates at the counter weight, dismounting the additional weight from the oscillating profile.
- Adjust the spring angle according to the new gravity center angle

In case the conveying track cannot be adjusted according to the above mentioned criteria, and, if eg. lateral vibrations or in certain areas “dead points” occur, the track stiffness is insufficient. The points of impact or separation work towards each other or asymmetrical structural parts of the track lead to unsteady running behavior. In this case proceed as follows:

- Mount additional stiffening ribs
- Connect impact or separation points by screwing
- Provide asymmetrical structural parts with counterweights or replace them by lighter materials.

Trouble	Possible cause	Remedy
Linear feeder does not start when being switched on	- Mains switch off	- Switch on the mains switch
	- Mains plug of the control unit is not plugged in	- Plug in the mains plug
	- Connecting cable between linear feeder and control unit is not plugged in	- Plug in the 5-pole plug at the control unit
	- Fuse in the control unit defective	- Replace the fuse
Linear feeder vibrates slightly	- Turning knob at the control unit is set to 0%	- Set the controller to 80%
	- Transport securing device has not been removed	- Remove the transport securing device
	- Wrong vibration frequency	- Check, whether the code in the plug of the linear feeder is correct (see type plate and 1. *Technical data*)
⚠ DANGER!	In case a linear feeder SLL 400 is operated without a bridge in a 7-pole plug, the control unit and the magnet is in danger!	
After a longer operating time the linear feeder does no longer come up to the conveying capacity required	- Fastening screws of the linear track have worked loose	- Retighten the screws
	- Screws at one or two spring assemblies have worked loose	- Tighten the screws (For tightening torques, refer to *1. Technical data*)
	- Magnetic gap misadjusted	- Readjust the magnetic gap (For gap width, refer to 1. Technical data)
	- Vibrator displaced towards the counter mass	- Readjust the vibrator (refer to *5.1.1 Adjusting the required running speed*)
Linear feeder produces loud noise	- Foreign bodies in the magnetic gap	- Switch off the linear feeder and remove the foreign bodies, after that check the magnetic gap adjustment
Linear feeder cannot be adjusted to a constant conveying speed	- The spring constant of the oscillating system has changed. The linear feeder works close to the resonance point	- Readjust the linear feeder. Springs must be removed. (Refer to *5. Starting*)

Hardware
(Hopper Controller)

1. Technical data

1.1 Functional description

The compact design of the control unit can supply all control units up to a load current of 6 ampere. It is intended for individual installation directly at the oscillating drive and completely pluggable. The correcting range for the potentiometer in the front plate has been adjusted in the factory at a reference drive and allows the adjustment of the output voltage from 40 to 280 volt eff.

The illuminated rocking switch in the front plate separates the control unit with 2 poles from the mains. For frequent switching or operation with a superordinate control unit there is the possibility of wattless disconnection by means a potential-free contact as well as by 16-30VDC voltage signal. The intervention into the device necessary for that is described in *3.5 Releasing the function by external components*.

When the time (approx. 0.5 seconds) adjusted after turning the power on has passed, the power is supplied.

1.2 EC - Conformity

The control device corresponds to the following regulations:

- Low voltage directive 2014/35/EU
- EMC directive 2014/30/EU

Applied harmonized standards:

- DIN EN 60204 T1
- EN 61439-1

The control device corresponds also to the UL/CSA regulations.

1.3 Technical data

Mains connection	230 Volt AC, 50 or 60 Hz, +10 -15% or 200 Volt AC, 50 or 60 Hz, +10 -15% or 115 Volt AC, 60 Hz, +10 -15%
Output voltage	40...208 Volt (eff.) adjustable, (230 V mains) 20...105 Volt (eff.) adjustable, (115 V mains)
Load current	max. 6 Amp.(eff)
Operating modes	1. symmetric full wave operation (oscillating frequency = double mains frequency) 2. asymmetric half wave operation (oscillating frequency = mains frequency
Operating mode selection	Encoding bridge in the load plug
Function release	selectable by internal jumpers
Release by external signal	Reverse battery protected input, level 16...30 VDC at 24 Volt approx. 8 mA
Soft start	Internally adjustable, standard approx.. 0.5 sec.
Insulation type	IP54
Radio interference suppression	according to EMV - regulations
Dimensions	104 x 213 x 153 (width x height x depth)

2. Safety notes

The safety notes shall in any case be read and understood. Their observance secures the conservation of valuable material and avoids health impairment.

 DANGER!	Electric danger, eg. at work under voltage
 DANGER!	Work at electrical equipment of the machine/equipment may only be carried out by a qualified electrician or by trained personnel under direction and supervision of a qualified electrician according to the electronic regulations! All safety and danger notes at the machine / equipment must be observed!! The electrical equipment of a machine / equipment must be examined regularly. Faults, eg. loose connections or damaged cables, must be eliminated immediately!
 DANGER!	Before opening the device unplug the power plug!
 DANGER!	Unplug the main power plug when plugging / unplugging the cord. Unplug the main power plug when adjustment and maintenance.

3. Information for starting

 DANGER!	Before the mains connection is made and the control unit is switched on, the following points must in any case be checked: - Is the control unit closed properly and with all screws? - Are the existing plug fixing devices locked into place/screwed down? - Are all cables and ducts undamaged? - Is the INTENDED USE guaranteed? - Does the mains voltage indication comply with the local power supply network? - Does the mains frequency indication at the oscillating drive comply with the local power supply network? - Is the correct operating mode set at the control unit? (on that read explanation operating mode)

Only if all above mentioned questions can be answered with yes, the control unit can be put into operation.

⚠ DANGER!	At initial starts or starts after repair work or exchange of control units/oscillating drives the minimum output should be set at the control unit before switching on the device. When bringing up the output it must be taken care for correct function.

3.1 Explanations on the term OPERATING MODE

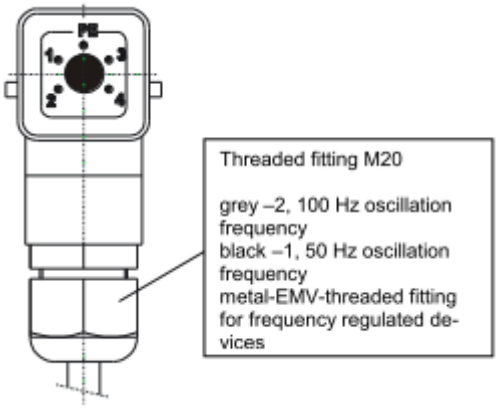
Oscillating drives are mechanical spring vibrators, which, according to weight and/or size, are adjusted to an oscillating frequency near the mains frequency. Two operating modes are possible:

1. Asymmetrical half-wave operation the oscillating drive operates with mains frequency.
2. Symmetrical full-wave operation - the oscillating drive operates with double mains frequency.

From that the following details result for the oscillating frequency:

Mains frequency	50 Hz	60 Hz
Operating mode 1	Oscillating frequency 50 Hz =3000 min -1	Oscillating frequency 60 Hz =3600 min -1
Operating mode 2	Oscillating frequency 100 Hz =6000 min -1	Oscillating frequency 120 Hz =7200 min -1

At a mains with 50 Hz only oscillating drives with 50 Hz or 100 Hz oscillating frequency can be operated, at a mains with 60 Hz, however, only oscillating drives with 60 Hz or 120 Hz oscillating frequency. The control unit can operate in both operating modes. It must, however, be switched into the correct operating mode. The mains frequency is of no importance for the control unit.



3.2 Switching over to a different mains voltage

The selection of the operating mode takes place by entering a code into the load plug of the oscillating drive. A jumper in the plug from connection 3 to 4 switches the control unit into operating mode 2: 100 or 120 Hz. If this connection is missing, the control unit operates in the operating mode 1: 50 or 60 Hz.

As a standard oscillating transport units are provided with the correct code in the plug. To assist the user, the threaded cable fitting has distinguishing colors on the connector jack for better recognition BLACK for operating mode 1, 50 Hz or 60 Hz, GREY for operating mode 2, 100 Hz or 120 Hz.

3.3 Setting the minimum and maximum output voltage

The control units have been adjusted in the factory at a reference drive. In special cases or after modifications a readjustment may become necessary. Here it must in any case be observed:

NOTE 	The output voltage can only be measured with an oscillating drive being connected! The measuring device must be designed for real effective measurement. (True-RMS), other measuring devices indicate random values. The load plug must be plugged in, as otherwise the measurement possibly takes place in the wrong measuring mode.

As the adjustment of the output voltage requires feeding of the mains voltage, the following safety note is very important:

 DANGER!	Feed the supply voltage only by means of a safety transformer! Carry out the measurements in the rooms/zones permitted for that. This measurement requires the employment of qualified professionals. After the measurements the control device must be put back into the original condition, as otherwise the release of series is stopped!

Important is the remark that the adjusting devices for the output voltage are not reactionless towards each other. I. e. that at a change of the maximum voltage the minimum voltage is slightly changed as well - and vice versa. That possibly means a repeated adjustment of both trimming potentiometers.

3.4 Switching over to a different mains voltage

The control unit can be operated at 230 V, 50/60 Hz as well as at 115 V, 50/60 Hz, must, however, be switched over to this voltage.

Changing from 230V to 115V:

Take the plug out of the electrical socket and open the device on the right side. Toggle the switch and close the side of the device. Test run. U MAX may have to be re-adjusted.

(Refer to *4. Plan showing the position of the operating elements on the boards* and *5. Scale drawing*.)

3.5 Releasing the function by external components

The standard adjustment of the control unit provides that the oscillating drive starts, when the mains switch is switched on.
Should it be preferred that the control unit work in start-stop operation, then the control unit should be opened — observing all of the precautionary measures listed above — and the jumper S1 re-plugged.
Refer to *4. Plan showing the position of the operating elements on the boards* and *5. Scale drawing.*
Remove the dummy plugs on the side of the casing and install a threaded cable fitting M16 with strain-relief; the cable will be fed through here for release. Release is achieved in two possible ways:

Release by a contact

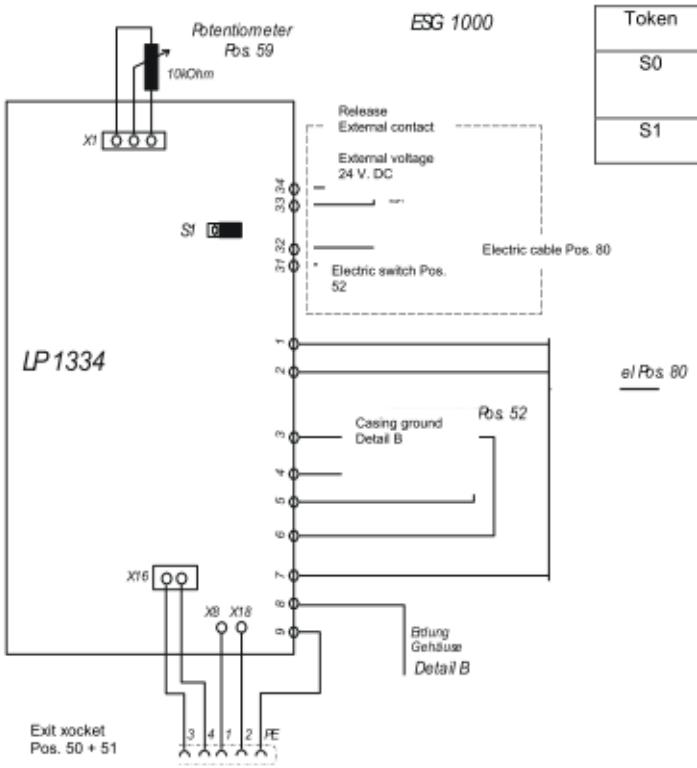
This simple, cost-efficient solution works in a way that the control unit is released by making the contact and the oscillating drive operates. The connection is made at the terminals 33 - 34. Some points should be observed:

- The connection is fed with mains voltage! Cable type and color, insulation regulations must be observed, the contact must of course be potential-free.
- Starting at 2 m and above, the cable must be shielded; the shielding is situated on one side of the control unit on the protective earth conductor.
- The cable length should not exceed 5 meter.
- The cable may not be installed in immediate neighborhood to high-energy switching equipment or strong interference fields.

3.6 Changing the soft start time

The soft start, the time-controlled bringing up of the output to the adjusted value is an effective protection for the oscillating drive against magnet impacts. At small oscillating drives, which start with high cycle times, the standard time is not necessary in any case, it does even impede the production flow. At the trimmer SOFT START the run-up time can be adjusted. As the case must be opened for this change as well, the safety notes mentioned above should be observed.

4. Plan showing the position of the operating elements on the boards



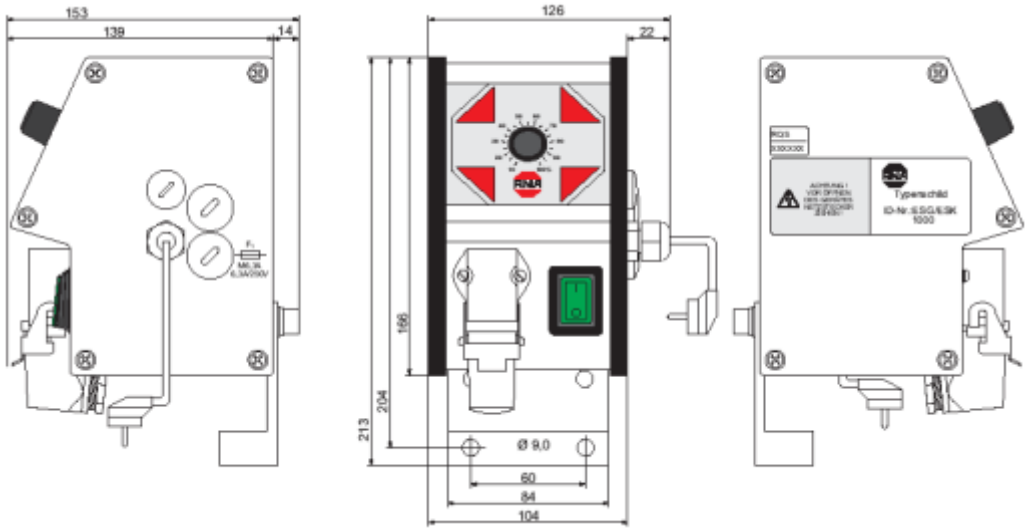
Token	Commentasy
S0	Switch 110 V – 230 V Electric voltage
S1	External release

NOTE	When replacing the fuse the preset value of M 6,3 A is to be used in any case. A fuse which is rated too high can lead to breakage of the control unit.

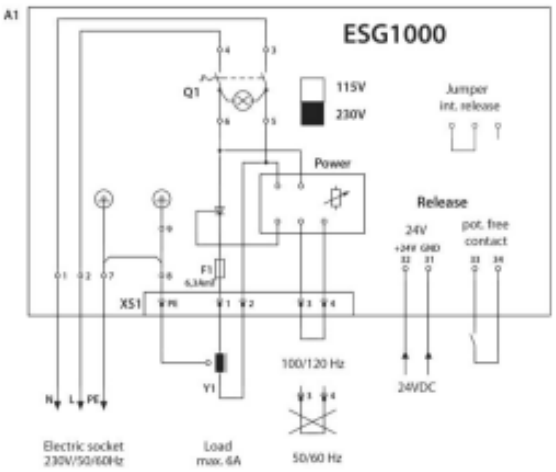
Release by voltage signal

The connection is done on the fasteners 31 (GND) and 32 (+24 VDC). The drive starts, when a signal is fed between 10 and 30 volt direct current in correct polarity. The input is protected against faulty polarity. The use of an optocoupler in the control unit makes the input potential-free and allows the installation with unscreened cables of nearly any length. Here too high-energy interferences should be avoided.

5. Scale drawing



6. Connecting diagram



The jumper must be diverted to enable the external release.

ATTENTION! The connectors for the release contacts are under voltage!

The bowl feeder operates when the release signal is passed or when the release contact is closed.

Operation selection:

Connectors X5 1/3 -> 4 connected,
oscillation frequency = double the current frequency

Connectors X5 1/3 -> 4 open, oscillation frequency = current frequency